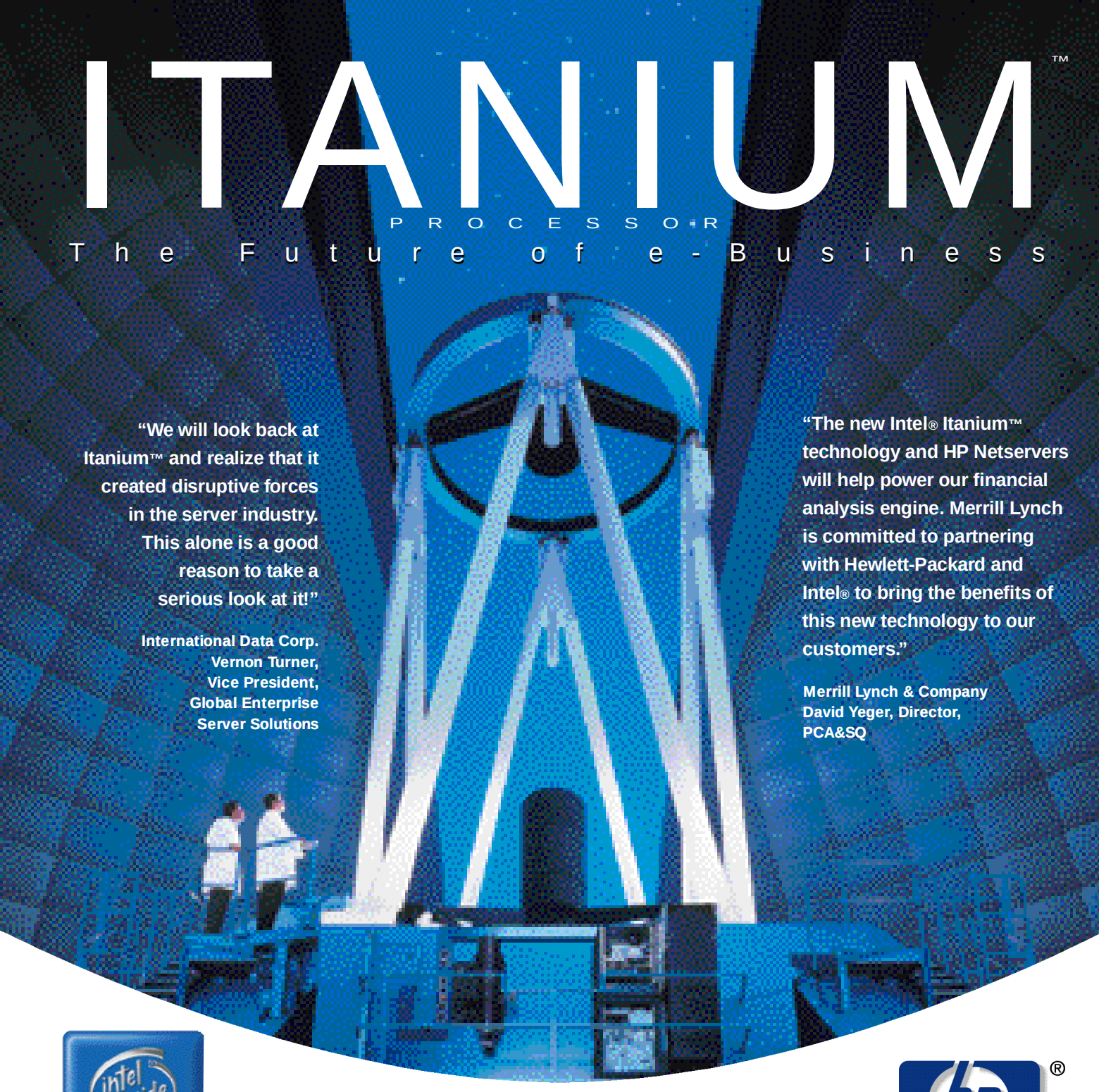
ITANIUM™

PROCESSOR

The Future of e-Business



"We will look back at Itanium™ and realize that it created disruptive forces in the server industry. This alone is a good reason to take a serious look at it!"

International Data Corp.
Vernon Turner,
Vice President,
Global Enterprise
Server Solutions

"The new Intel® Itanium™ technology and HP Netservers will help power our financial analysis engine. Merrill Lynch is committed to partnering with Hewlett-Packard and Intel® to bring the benefits of this new technology to our customers."

Merrill Lynch & Company
David Yeger, Director,
PCA&SQ

intel inside
ITANIUM

Discover the future of e-business by attending this must see Webcast.

Peer into the future today at www.okpmw.com/ITANIUM.

hp invent

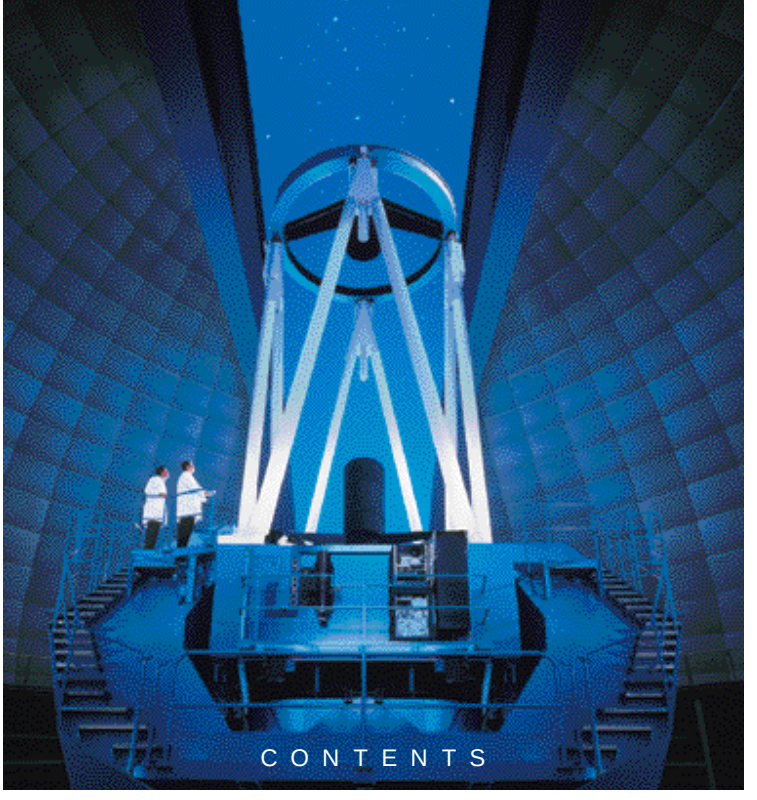
INTRODUCTION

The Itanium™ processor is for Intel® as important a change as was the introduction of the i386 thirteen years ago. Jointly developed with Hewlett-Packard® and seven years in development, Intel's Itanium processor is driving an industry-wide wave of development activity. Companies providing operating systems, development tools, enterprise applications, e-Commerce engines and technical computing solutions have worked in parallel to create an environment that today allows business to deploy real solutions on Itanium processor family (IPF) platforms.

Not content to stop here, Intel has engineering teams at work filling-out a product family based on the Explicitly Parallel Instruction Computing (EPIC) architecture. At the Intel Developers Forum in the Spring of 2001, Intel and Hewlett-Packard demonstrated working first silicon of the next product in the IPF, code named "McKinley", with HP-UX. In true fashion these products are just the first steps in a roadmap that will enable rapid performance improvements and dramatic price/performance advances.

The articles in this magazine give you a sample of what's in store for you at The Future of e-Business Webcast taking place on August 14th or September 12th, 2001. If you are a CIO, CFO or Senior IT practitioner then you can't afford to miss this opportunity to interact directly with Itanium experts from Intel and Hewlett-Packard. They will inform you on the vast potential of this truly unifying processor architecture that brings together the best architectures of the past and carries them forward with an entirely new way of doing things.

To attend the Webcast, register NOW at www.okpmw.com/ITANIUM, or call toll free 1-800-806-5556.



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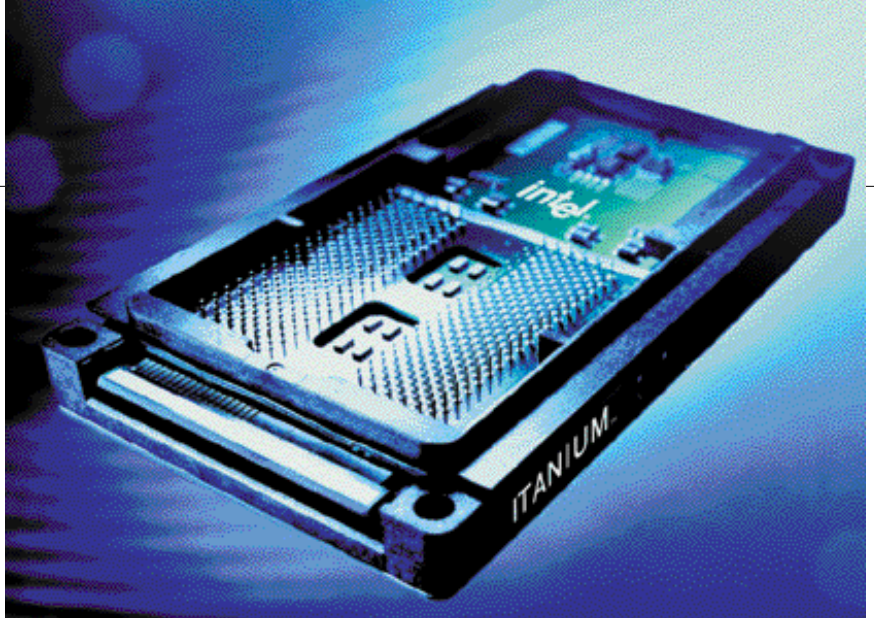


THE CURTAIN RISES ON ITANIUM:

The next generation of microprocessor architecture

The Intel Itanium processor is the first in a family of processors based on the brand new 64-bit Itanium architecture. It was designed from the ground up to meet the increasing demands for high availability, scalability and performance needed for enterprise-class and Internet-enabled computing. Itanium enables breakthrough capabilities in processing terabytes of data, increased transactions, secure e-commerce and complex computations.

When Intel and Hewlett-Packard (HP) co-developed the Itanium architecture, they realized that any future computing platform would need to offer long-term benefits in scalability and performance over current architectures. Tweaking an existing instruction set architecture would not suffice. With the Itanium processor family, Intel introduces Explicitly Parallel Instruction Set Computing (EPIC) — which enables Itanium processors to work on as many as 20 operations at once. Unlike simple RISC-based architectures, EPIC capitalizes on hardware and software synergy and takes advantage of advanced compiler techniques, massive register resources, world-class floating-point performance, vast memory addressability, predication and speculation capabilities, all working in unison to make Itanium processor-based servers and workstations appropriate for the most demanding applications.

Just as important, broad support from independent software vendors (ISVs) is helping ensure that advanced solutions are available first for the Itanium-based platform. Leading ISVs such as Oracle, are collaborating with HP in developing Itanium-based applications.

"Oracle is working with HP to optimize Oracle8i™ for Itanium servers," says Juan Jones, VP of the Platform Technologies Division of Oracle Corporation. "Oracle8i and Itanium are a cost effective combination that will reliably support lots of users, and lots of data. It is expected that we will be offering support for Oracle9i™ for Itanium on HP-UX and Linux."

Itanium's revolutionary capabilities have been embraced by many of the largest ISVs who are developing applications for Itanium in the following areas:

- Enterprise business applications (business intelligence, data mining, supply chain management, OLAP)
- Secure e-Commerce and catalog solutions
- High performance technical computing
- Internet infrastructure (directory, security, proxy, cache and Web servers)

The Itanium processor family extends open-standards-based computing to the enterprise and brings flexibility, choice and value over proprietary solutions. A broad range of Itanium-based software offerings from industry-leading vendors, mass adoption by hardware vendors, combined with IA-32 and PA-RISC instruction binary compatibility in hardware, provides an increased level of investment protection. ❖

ITANIUM: THE FUTURE OF e-BUSINESS WEBCAST PROGRAM AGENDA

Your choice of dates to attend:
Tuesday, August 14th or Wednesday, September 12th
Time: 1:20pm E.S.T., (10:20am P.S.T.)

1:20 (10:20) - 1:30 (10:30)
Logon to Webcast

1:31 (10:31) - 2:00 (11:00)
Webcast Show
Our Host, Mike Carbone, will introduce guests from Intel and Hewlett-Packard. The format of the show is much like "Larry King Live" on CNN. Mike will be asking pointed questions to our guests who will use video, graphics, PowerPoint and experts to support their answers.

On your behalf, Mike will endeavor to understand some of the following issues:

- Why do I need to care about Itanium?
- What are the key features and benefits of the Itanium architecture?
- How does Itanium compare to other processors currently available?
- Which industries stand to benefit most from Itanium and why?
- What is the nature and availability of Itanium products, services and support today and in the future?

2:01 (11:01) - 2:11 (11:11)
Live Q&A
Now it's your turn. Our Host and guests will answer your online questions live.

2:12 (11:12) - 2:40 (11:40)
Live Chat Session
Our Host and guests will participate with viewers in a live chat.

For more information or to register for the Webcast date of your choice please visit: www.okpmw.com/ITANIUM, or call toll free 1-800-806-5556.

ITANIUM LEVERAGES TECH INVESTMENT

Unlike some breakthrough technologies you don't need to change everything at once when you move to Intel's Itanium processor family (IPF). From the outset of joint development between Hewlett-Packard (HP) and Intel, the IPF specification was carefully designed as part of a larger system and solution, and the design goals reflected this. Careful thought on the requirements of the future went into the architecture and the low-level interfaces between the hardware and the I/O subsystems, or the chipsets, or the software.

The result is that HP is uniquely able to offer its PA-RISC installed base a smooth transition to Itanium. Existing 32-bit and 64-bit applications written for PA-RISC, as well as 32-bit applications for Windows and Linux (if 64-bit clear) run on Itanium in compatibility mode without recompiling or recoding. This flexibility is a major advantage, especially for corporate developers responsible for large inventories of existing applications. In addition to offering a smoother transition, this development effort has resulted in more independent software vendor applications available sooner, with better performance and functionality then for any other new architecture. There are hundreds of PA-RISC applications already available today, and HP's Itanium products have binary compatibility with all of them under HP-UX.

While users will get effective performance in compatibility mode, they will not achieve the full power of Itanium without running their applications in native mode. This is not an important consideration for non-performance critical applications, but it is recommended users port other applications from compatibility to native mode at some point to take full advantage of Itanium. This will require recompiling, and may require some recoding.

HP's dual platform strategy allows customers to make the transition to the IPF at a pace that suits them. Current PA-RISC customers may already be using an operating system and hardware that is IPF-ready. HP offers full consulting, education, software, financing, services, support and associated programs designed to help customers plan, migrate, port, support and implement their Itanium-based systems (See page 14 for details). ✦

EPIC: RISING OVER RISC

For years, processor performance has obeyed the durable dictum of Moore's Law, stated by Intel founder Dr. Gordon Moore. To wit: processor power doubles every 18 to 24 months. Now as businesses operate in the Internet economy that law faces a challenge. The incredible growth in network traffic, coupled with sophisticated applications and rich data types, is placing unforeseen strains on servers, clients and workstations. The result: demand for performance outstrips processor performance increases.

Vernon Turner
VP, Global Enterprise Server Solutions, International Data Corp.

"Itanium is not about sixty-four bit processing: it's about finally running heavy duty enterprise applications on industry standard technology. At this point, the customer wins and, in the long run, we should expect to see the server market expanding as a result of this."

Foreseeing the future

The fact is, no one could have predicted ten years ago the impact that the Internet, e-Business, and advanced collaborative technologies would have on us today. E-commerce servers churn out millions of secure transactions every minute of every day, while database servers manage dynamic, terabyte-sized stores of mission-critical information. Engineers and designers use workstations to develop complex models of physical products that can grow to hundreds of megabytes or even more in size.

In the past, companies turned to proprietary processors based on reduced instruction set computing (RISC) to handle difficult workstation and server applications.

The desire for higher performance in enterprise and mission critical environments has led end users to purchase RISC-based servers and workstations. On the desktop, productivity applications are mainly deployed on IA-32 architectures. As a result, IT departments must manage the complexity of multiple architecture bases and environments, driving up the cost of ownership.

The case over RISC

Although enterprise and mission critical applications are deployed on RISC today, that technology is approaching the point of diminishing returns. Each new generation of RISC processors becomes more complex, and more expensive.

The Itanium architecture is a new approach to processor design that overcomes the limitations of traditional RISC architectures. The outcome of collaborative development between Intel and Hewlett-Packard (HP), Itanium fuses the parallelism of Explicitly Parallel Instruction Computing (EPIC) with the power of 64-bit processing to deliver innovative predication, prefetch, and speculation techniques into a highly scalable architecture that will provide leading-edge performance. Itanium is the pervasive processor architecture for years to come.

EPIC refers to the ability of the software to extract maximum parallelism (potential to work in parallel) in the application code and to describe it "explicitly" to the hardware. It allows new levels of Instruction Level Parallelism (ILP) for more instruction issues per cycle.

Itanium processors boast two floating point execution units, four integer execution units, and three branch/units as well as the Internet Streaming Single Instruction Multiple Data (SIMD) Extensions found in Pentium® III processors. With 128 floating-point registers and 128 integer registers, Itanium processors are able to simultaneously handle truly vast numbers of operations, yielding greater system and application performance.

What's more, the 64-bit addressability of the Itanium family of processors ensures that server designs will be able to scale to virtually any task. With the ability to support literally thousands of terabytes of physical system memory, Itanium-based servers can power lightening-quick in-memory databases and run massive application sets that would otherwise task today's 32-bit servers.

Perhaps most important in the age of e-Business, Itanium-based systems are proving themselves to be a peerless platform for secure transactions. In a document published in April 2001 by Coradiant Research, formerly known as Networkshop, the research arm of Coradiant Inc., the 800MHz Itanium processor

showed a greater than 10 fold advantage in processing secure transactions over existing, RISC-based processors (See related article, below).

Recognizing this quantum leap in performance, scores of software vendors, OEMs, hardware makers, and solution providers have announced products that will be tuned for the Itanium architecture (See list at http://developer.intel.com/design/ia-64/commit.htm).

Additionally, Intel and HP are working actively with the developer community to ensure the rapid delivery of new solutions (See Intel's developer resource site at: http://developer.intel.com/design/ia-64/ and HP's developer resource site at: www.hp.com/products1/itanium/developer/index.html). At the same time, the Intel 64 Fund is providing funding and expertise to companies working on innovative solutions for the Itanium-based platforms.

Link to the present

Most businesses can't afford to scrap one architecture for another, no matter the performance advantage. That's why the Itanium architecture offers full compatibility with the universe of existing applications and business systems written for the IA-32 processor. In addition, HP offers full binary compatibility with HP-UX, allowing you to run your PA-RISC-based applications on HP Itanium systems. That kind of investment protection, combined with the powerful advantages of the revolutionary EPIC architecture, makes Itanium the preeminent computing architecture for the Internet age. ✦

Eric Packman
CTO
Coradiant Inc.

" The Itanium has demonstrated performance per CPU faster than modern dedicated SSL accelerator boards. Most boards can handle up to 180 new SSL connections per second; each processor in the Itanium handles about 300, and with less generated latency. The Itanium seems to be much more efficient at SSL transactions (per MHz) than any other processor we've ever seen."

SSL TRANSACTION PROCESSING:
Itanium 12x faster than Sun UltraSPARC-II

A positive customer experience is the success measure of any e-Business. The goal is to get your customers to come back and purchase your products and services securely and quickly on the Web without having to try their patience.

For e-Business, Web server SSL connection capacity and latency are critical factors. These factors are pushing the limits of your customers' patience. The Itanium architecture removes bottlenecks at a system level, making it an ideal platform for your business.

Case in point: Coradiant Research — a premiere managed service provider and an authority on SSL performance benchmarking — performed benchmarks on the Intel Itanium server to determine SSL connection capacity and latency. The same tests were also performed on a Sun Enterprise 420-R for comparison on a different processor architecture.

The servers were tested in various processor configurations. Apache (v1.3.12) Web Server with mod SSL (v2.6.6) was used on Sun's SPARC-based system with Solaris 7 as the operating system. Apache (v1.3.12) Web Server in conjunction with RSA's SSL-C module were used on the Intel Itanium server with Turbo Linux IA-64 as the operating system. (For details on Hewlett-Packard's Itanium-based secure Web serving solutions, see page12).

Coradiant used a combination of Open SSL and proprietary software to measure SSL transaction rates and latency. The SSL connections/sec test demonstrated the maximum transaction rate to be directly proportional and scaled to the number of processors in a given system architecture.

At 1.78 times the clock speed of the Sun UltraSPARC-II, the Intel Itanium performed more than *twelve times* the number of SSL connections/sec than the UltraSPARC-II. Additionally, in the results from latency tests the UltraSPARC-II began to bottleneck at a lower number of connections per second compared to the Itanium. In practice, a server is never run at the maximum number of connections per second, however, the Itanium demonstrated it can scale further to keep latency to a minimum where the UltraSPARC-II began to bottleneck earlier on when the number of SSL connections per second became excessive. (For additional transaction processing and security benchmarks,
See:
www.intel.com/eBusiness/products/ia64/overview/bm012101.htm#2).

HIGH AVAILABILITY, RELIABILITY AND SCALABILITY MAKE ITANIUM SERVERS IDEAL FOR e-BUSINESS

It is the challenge that faces every IT manager, every business manager and every CIO: how do you scale online services to face increasing demand from customers, suppliers, partners and employees? The rapidly expanding world of e-Business requires solutions that are available 24x7. For companies with transaction-intensive Web sites, system downtime means lost sales and, eventually, lost customers.

Better availability equates to better business. Itanium-based solutions are designed for availability from the hardware components and platforms up through the operating system, applications and management solutions. Itanium delivers the performance necessary to maintain a high-volume, responsive e-Business site.

The Itanium architecture allows servers to address massive amounts of data, which can be stored and manipulated in main memory to greatly improve response times. The ability to address these large stores of main memory also allows servers to scale to task, reducing the need to page code and data to disk.

Availability at the components leve l

Itanium-based components contain a number of built-in features to maximize uptime. These include an enhanced Machine Check Architecture (MCA) that provides improved error recovery and enhanced Error Correction Code (ECC) coverage on memory and data paths. MCA allows an enabled platform to recover from an error that would have previously caused system failures. ECC and correcting circuitry detect and often fix errors automatically so that the system continues to run and remain available. The 'built for' Itanium processors' chipsets also provide memory error containment features so IT staff can reconfigure around a defective memory bank without having to reboot the system.

Availability on Itanium platforms

The Itanium architecture further enables servers to be designed for high availability. Built-in hardware redundancy, hot-plug and hot-swap hardware such as disks, power supplies, fans and PCI, failover Network Interface Cards and data protection via RAID all increase the availability of the server. Future enhancements of Itanium-based servers will provide the ability for "hot" replacement of memory and processor modules. As the industry converges on the new scalable, high-performance I/O standard (System I/O), improved modularity, redundancy and serviceability will increase system availability.

System management - Anytime, anywhere

High availability operation demands strong system management and an IT infrastructure that constantly monitors systems to predict and detect problems. Many Itanium-based platforms provide access to system information, which is collected via platform instrumentation and through common system management capabilities. The system management features on Itanium-based platforms ensure that platform management information can be accessible, across multiple paths, including dial-up and over the LAN. Additionally, the information can be gathered when the operating system is not responding, and even when the system is not powered on.

Support and operating system selection

Hewlett-Packard (HP) leads the industry by offering the highest levels of support required for 24x7 e-Business environments for Itanium-based systems, leveraging decades of enterprise and mission critical support on PA-RISC-based servers.

At the same time, businesses will benefit from the outstanding selection of operating systems from HP tailored for the Itanium-based platform. No other platform vendor currently has the breadth of operating system support that can be found only on Itanium architecture. ❖

ITANIUM WORKSTATIONS MARK NEW ERA FOR ENTERPRISE COMPUTING AND TECHNICAL APPLICATIONS

The Intel Itanium processor, first in a family of 64-bit Itanium architecture products from Intel, is targeted at the most demanding enterprise computing and technical applications. Itanium raises the bar for workstation systems by delivering new levels of performance and capabilities for the most demanding memory and floating-point intensive workstation applications. With the Internet providing instant data delivery worldwide, businesses are seeking ways to speed design times and boost productivity ahead of the competition.

Applications in areas such as digital content creation (DCC), financial modeling, business intelligence, scientific and medical data analysis, electronic design automation (EDA), and mechanical computer aided engineering (MCAE) play a key role in these efforts. At the same time, the constant increase in available compute power has spawned workstation applications and designs that are more complex than almost anything seen in years past.

The Itanium architecture marks a new era for Enterprise Computing and Technical Applications with its combination of Explicitly Parallel Instruction Processing (EPIC) and 64-bit computational capabilities. This revolutionary new architecture, combining increased memory and I/O bandwidth, parallelism, massive register sets, and large memory addressability, delivers world-class floating-point performance for workstation and scientific applications. (For performance data on Hewlett-Packard's i2000 workstation, **See:** www.hp.com/workstations/products/itanium/performance.html).

Even as companies contend with a power crunch at the high end, they face thorny platform issues across the enterprise. Traditionally, IT departments have maintained

dedicated workstation platforms requiring redundant system and application deployments, additional management, and increased complexity. Those solutions begin to fall apart when design teams are dispersed and collaboration and data sharing occur over the Internet. Today, companies need to integrate the full functionality of the corporate network and communications infrastructure into the workstation — or risk losing access to vital skills and resources.

"Alias|Wavefront has been working very closely with Intel and Hewlett-Packard in the development of our professional 3D animation software Maya to ensure we take full advantage of the addressability that Itanium provides. Our goal with Itanium is to continue to deliver enhancements and optimizations that improve Maya's overall ease of use and efficiency leading to greater productivity and throughput."

Chris Ford
Sr. Product Manager
Alias|Wavefront

Itanium-based platforms are designed to deliver new capabilities for high-end workstation computing while aligning within existing corporate networks. These systems extend the open computing model to high-end workstation environments, delivering greater choice and superior price/performance over proprietary architectures.

The Itanium difference

The Itanium processor combines high availability and scalability features to provide the optimum enterprise solution for high-end workstations. It features an optimized design that vastly increases main memory access, thus allowing truly massive programs and data sets to reside in fast system memory for computation. The result goes beyond improved performance. On current workstations, extremely complex undertakings, such as aircraft and chip design, often must be parsed into multiple files. However, the Itanium processor enables designers to work on a single, massive model that reduces the complexity and provides a clearer overall view of the project.

The Itanium processor features an optimized design that vastly increases main memory access, allowing truly massive programs and data sets to reside in fast system memory for computation.

Of course, performance is paramount in the workstation arena. The Itanium processor employs groundbreaking EPIC technology to maximize parallelism (executing more instructions per clock than traditional architectures) and to take advantage of optimized compiler code. Parallelism allows the system to deliver higher performance and scalability by enabling the compiler to provide more information to the processor. The result: Itanium-based workstations are able to execute many operations simultaneously on a sustained basis. Fine control over memory accesses, computation order, and other program aspects ensure that Itanium-based workstations operate at peak efficiency. Itanium systems also deliver world-class floating-point performance (6.4 GFLOPS max) for technical compute-intensive applications. This further improves the performance of precision calculations in areas such as fluid and chemical models analysis. A balanced system design keeps data moving smoothly around the processor. The first Itanium-based workstations feature 4.2 GB/s of memory bandwidth to provide rapid access to data. Support for symmetric multiprocessing (SMP) operation — ranging from 2 to 64+ processors — provides ample scalability. Itanium-based workstations with 2.1 GB/s of external I/O bandwidth enable powerful clusters to be built using off-the-shelf parts.

Corporate citizens

One of the biggest problems with traditional workstation deployments has been the cost of procuring hardware. Workstations based on Intel® Pentium® III Xeon™ and the new Intel® Xeon™ processors have broken down those barriers, thus enabling companies to deploy workstations to all who need them. The Itanium processor extends the price/performance leadership of the Intel architecture to the most demanding arenas of workstation computing.

The result is an end-to-end workstation platform that makes it possible to integrate

workstation tasks into business operations. Businesses that need to accomplish daunting technical computations can do so, while meshing those high-end workstations seamlessly with the more affordable systems employed by other engineers and managers. IT departments can avoid costly multi-platform deployments by utilizing Intel architecture solutions across the enterprise while enabling network-based collaboration for higher productivity.

Corporations can also look to the substantial benefits that the open computing model of the Itanium platform brings when compared to proprietary platform models. Itanium platforms provide the choice of enterprise class operating systems, and hundreds of enterprise and technical applications. The result: companies can seek best-fit solutions, rather than be constrained by the limited choice of a proprietary platform.

Moving to Itanium

The shift to Itanium-based workstations is well underway. Independent software vendors (ISVs) are porting over 400 applications to the Itanium processor. Both Hewlett-Packard and Intel are working actively with the software community to help optimize code. Intel's Application Solution Centers, and HP's Partner Technology Access Centers, provide technical consulting, benchmarking, and code analysis to ISVs. They help ensure that Itanium-optimized applications take full advantage of the new processor design.

The benefits of choice extend beyond applications. In addition to Microsoft Windows XP 64-bit Edition, companies will be able to run HP-UX 11i v1.5, Red Hat® Linux Release 7.1, as well as other flavors of Unix on Itanium-based workstations. ✦

For information on Hewlett-Packard's Itanium-based i2000 workstation see page15.

Early Adoption of Itanium

To download a META Group white paper on the sweet spots for early adopters of Itanium-based solutions,
See: www.intel.com/eBusiness/pdf/prod/ia64/sweetspot.pdf

To download an Aberdeen Group executive white paper on who benefits from early adoption of Itanium-based solutions,
See: ftp://download.intel.com/design/IA-64/Downloads/ia64rev2.pdf

Digital Content Creation

To download an IDC white paper on Itanium-based solutions for the digital content creation market,
See: www.intel.com/ebusiness/products/ia64/overview/itanium_dcc.pdf

Financial Modeling

For details on how Infinity, A SunGard Company, is working with Intel to port its Panorama risk management software to Itanium-based platforms,
See: www.intel.com/eBusiness/products/momentum/ar1009.htm

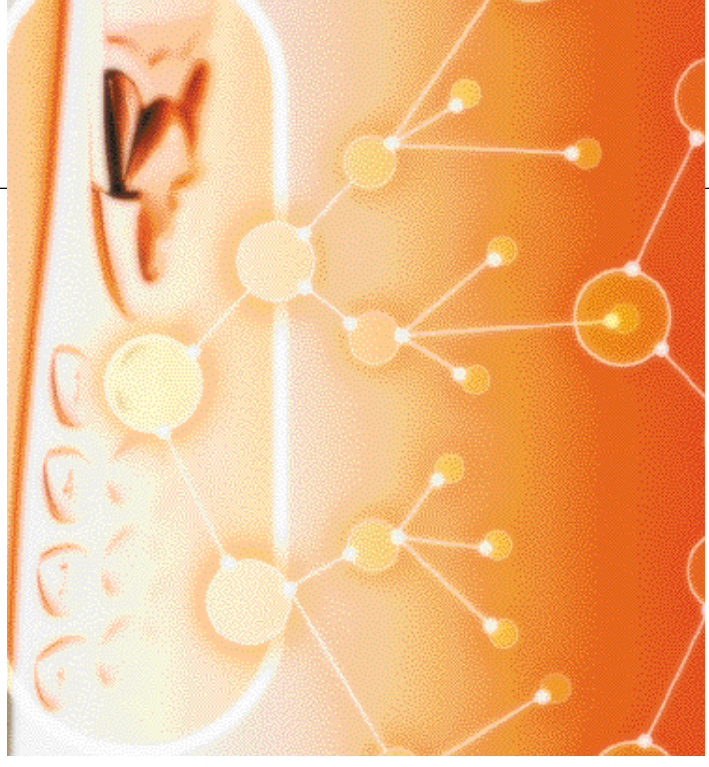
To download an IDC white paper on Itanium-based solutions in the Financial Services Market,
See: ftp://download.intel.com/design/IA-64/Downloads/financial_mkt.pdf

3D Graphics/Design

For information on how graphics hardware designer 3Dlabs demonstrated workstation-class OpenGL graphics on the Itanium processor using the 3Dlabs Oxygen GVX1 card,
See: www.intel.com/eBusiness/products/workstation/midhigh/ar2006.htm

For additional information on how Itanium-based workstations speed complex design projects,
See: www.intel.com/eBusiness/products/momentum/ar1010.htm

For additional information on how Itanium-based workstations power data analysis and visualization,
See: www.intel.com/eBusiness/products/momentum/ar1008.htm



ITANIUM IDEAL FOR TECHNICAL COMPUTING, SECURE WEB SERVING, APPLICATIONS DEVELOPMENT AND BUSINESS INTELLIGENCE

The Itanium processor family's (IPF) combination of Explicitly Parallel Instruction Computing (EPIC) with 64-bit computing allows it to set new standards for instruction-level parallelism, allowing a higher instructions issue per cycle than traditional architectures. Additionally, Itanium has more than 256 registers, helping it achieve outstanding parallel performance, also focusing on floating-point calculations and loop-intensive code. Because the IPF specification can do more per clock cycle than other processors, future generations will achieve exceptional performance to allow users to tackle more complex problems, work with more complex designs, and gain faster time-to-market. These features — coupled with scalability, reliability, high availability, backwards compatibility, low cost entry and the most flexible OS environment on the market — make Hewlett-Packard's (HP's) Itanium-based servers and workstations ideal for technical computing, secure Web serving, e-commerce, applications development and business intelligence.

Technical computing

In May 2001, HP announced the world's fastest SPECfp2000 result with a score of 715. This result was achieved on an HP Itanium-based server configured with two 800MHz processors (4MB cache) using the Microsoft Windows XP 64-bit operating system. The uniprocessor 800MHz server result is 701. An HP Itanium-based workstation running an 800MHz processor with a 2MB cache achieved a SPECfp2000 score of 655.

To provide advanced solutions utilizing the speed and power of Itanium, HP is assisting independent software vendors (ISVs) to port their HP-UX applications to Itanium in key market segments such as Computer Aided Engineering (CAE), life sciences, Mechanical Computer Aided Engineering (MCAE), Digital Content Creation (DCC) and Electronic Design Automation (EDA). For a list of those ISVs and the specific benefits of Itanium in each segment, follow the links at: www.hp.com/products1/itanium/solutions/technical_computing/index.html.

Secure Web serving and e-commerce

One of the biggest bottlenecks for service providers, Internet companies, and corporate Intranets is in handling secure Internet connections such as logins, handling of private information, and e-commerce transactions. The cost of handling secure transactions can be ten times or more of a typical Web connection.

Encryption algorithms push beyond the limits of 32-bit arithmetic to test the speed of even the most sophisticated systems. However, Itanium systems are naturals at encryption. They are ideal cipher machines. It is estimated that Itanium processors can decrypt-encrypt the industry-standard RSA public key algorithm five times faster than a dedicated hardware accelerator. RSA have optimized their widely used BSAFE SSL-C, which allows developers to implement the SSL protocol, and BSAFE Crypto-C software for Itanium.

For secure Web serving HP delivers an industry-leading solution enabling secure Web transactions in a single Itanium-based system. The solution can scale to build Web services for large data centers, and supports the type of administration and management capabilities that enterprises look for, including management of clusters and provisioning scripts allowing reduced costs of handling secure Web transactions, improved SSL performance and an enhanced customer experience. In fact, HP's Itanium-based server running HP-UX optimized RSA algorithms are approximately 10 times faster than the Sun Microsystems UltraSPARC-III.

HP offers Apache and Zeus-based solutions, each capitalizing on the outstanding encryption/decryption capabilities of Itanium. For solution highlights follow the links at: www.hp.com/products1/itanium/solutions/index.html.

Itanium application development

HP has complemented its internal expertise with targeted acquisitions and partnerships to pull together the most complete, best-of-breed application development ecosystems for Itanium. Development solutions exist for: HP-UX, C/C++ on Windows and Linux, Java on Windows and Linux and e-services.

The HP-UX 11i v.1.5 operating system was developed for Itanium, so applications written for this platform run on Itanium with complete compatibility for applications and data. In addition, HP offers compilers and free development tools for C, C++, and Fortran 90 for Itanium, as well as computational libraries. As a pioneer in e-services, HP fully supports development on the e-speak platform to create dynamic Internet-based relationships through ad hoc discovery and intelligent interaction of e-services.

The HP IPF developer program represents a "who's who" of industry heavy weights. For details on the developer program and ISV initiatives follow the links at: www.hppartners.com/ia64/ipf-partners.php3.

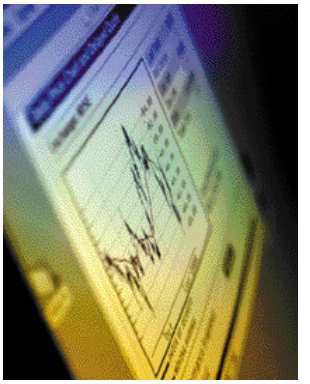
Business intelligence

Business intelligence means getting the right business information when you need it. With the help of a strong business intelligence solution, companies can divine subtle patterns from huge mountains of data. Because of its 64-bitness and massive parallelization, the IPF has the power to sift intelligently through huge amounts of data. Itanium's very large cache, 64-bit registers, and massive memory support deliver significant performance gains, reduce disk access time, and enable more complex queries. This cuts down on the 'time to decision' and delivers the required granularity.

Architectural functions that improve the parallelism of the IPF, such as speculation, prefetch, and predication, dramatically increase efficiency of business intelligence applications by keeping the pipelines full and cutting expensive mispredicts where the processor has to start its calculations over. All these extraordinary benefits in business intelligence can give companies the competitive advantage they seek.

For technical information of the benefits of the IPF and business intelligence,
See:
www.hp.com/products1/itanium/solutions/techintel.html.

For information on how HP and SAS are utilizing Itanium,
See:
www.hp.com/products1/itanium/advantage/sas.html. ✦



AS CO-ARCHITECT, HP OFFERS COST-EFFECTIVE, ONE-STOP-SHOP TRANSITION TO ITANIUM

"An important factor in choosing HP as a preferred vendor was their long-term enterprise systems roadmap, which of course includes Itanium. Due to their joint development with Intel, I trust that HP can provide a smooth transition to the new architecture and a broad Itanium solution set (services, financing, consulting, etc.) enabling us to realize the full benefits of Itanium, including enhanced performance, scalability, and multi-OS capabilities that will significantly reduce IT complexity and costs."

Gafar Lawal
Director of Architecture
Merrill Lynch, Private Client Technology

Expertise makes the difference with a new technology, and Hewlett-Packard (HP) services are your pipeline to Itanium expertise. For over 8 years HP has worked closely with Intel in developing the Itanium family of processors (IPF). Utilizing its extensive experience in high-performance computing and chip design, HP provided Intel with the initial blueprint to produce the IPF. As the co-architect of IPF, HP has a substantial competitive advantage over other vendors offering Itanium-based products — and no where is this advantage more important than in developing the applications, services and support structure tailored to address customer needs in deploying a new microprocessor architecture.

When customers are ready to develop for Itanium and deploy Itanium-based solutions, HP's portfolio of products, services and support come to bear. Following is a snapshot of those comprehensive services available to customers who deploy HP Itanium-based systems.

Planning services
Expert consultants help customers determine the optimal way to leverage Itanium for business advantage, and how to incorporate it into a company's strategic and tactical plans for information technology (IT). This includes assistance in planning a new operating system implementation and a cutover to Itanium.

Support services
Customers want a single point-of-contact for support of their hardware and software. To extend the value of HP's proactive services during Itanium evaluation, testing and production planning phases, the company offers a combination of leading technical assistance with proactive account services. Called HP Personalized System Support, customers receive an assigned Account Support Engineer who acts as a constant partner throughout the planning and implementation life cycle.

Porting and migration services
Thousands of programs run on Itanium in compatibility mode with minimal change, yet these applications run more effectively after porting to take full advantage of Itanium's distinctive capabilities. HP offers a flexible set of porting and migration services that customers can select from to assist in the transition. They are:

- Workshop - investigation of your needs and development of a high-level strategic plan
- Guidance - design services to architect your porting and migration strategy
- Detailed assessment - an in-depth investigation to yield a detailed migration plan with specific recommendations
- Solution delivery - hands-on porting and migration of specific applications, including re-engineering and integration with existing applications
- Online services - tap-into expertise and receive assistance with posting and migration questions and challenges

Implementation services
HP's New System Start-Up Service is an in-depth offering that includes:

- Basic network configuration that incorporates a customer's new Itanium system
- Assistance in setting up files and an accounting structure
- Configuration of the OS
- Assistance in developing implementation operating procedures

Education services and course offerings
Effective training is crucial in accelerating the transition to Itanium. Experts at HP Labs have assisted in producing a comprehensive training curriculum. Online courses cover an overview and administration on all three OS's: HP-UX, Windows and Linux. Courses have been developed for IT managers, application developers and system administrators. For details and to download your free "Introduction to Itanium" course coupon, **See:** www.education.hp.com/itanium_promo.htm.

For additional information on these services contact your Hewlett-Packard representative or an authorized HP reseller. ✦

HP'S PORTFOLIO OF ITANIUM SERVERS AND WORKSTATIONS

HP server rx4610
Their first entry-level Itanium-based server (shown left, with rack containing five rx4610's), the rx4610 contains two to four Itanium processors (at 800MHZ and 733MHz) and is complemented with HP's powerful combination of up to 64GB of SDRAM memory, expandable I/O bandwidth (4.21BG/sec), and disk storage. The rx4610 is an ideal stepping-stone to Itanium computing.

The rx4610 gives you the flexibility in choice of operating system, including HP-UX11i v1.5 for Itanium, the only proven Unix operating system on the market today. Microsoft Windows 64-bit and Linux 64 (Red Hat Release 7.1) are also supported. This translates into a wealth of business and technical application availability from HP's independent software vendors (ISVs).

HP server rx9610
Their most powerful Itanium system is the rx9610 server with up to 16 processors (shown second from left). It's built on cell architecture similar to that of the PA-RISC based Superdome to ensure superior flexibility, scalability and high availability. High availability features at a system level on the rx9610 includes hot-swappable fans and power supplies, as well as extensive I/O options to meet the demands of high performance computing.

The rx9610 supports HP-UX 11i v1.5 for Itanium. The strong combination of the system's features and HP-UX gives you an Itanium solution ideal for your technical computing and Internet application needs.

HP i2000 workstation
Their first workstation (shown third from left) to be equipped with Itanium processors, the i2000 represents a new chapter in workstation computing. It's presently available in two configurations:

- an economical entry-level uni-processor running at 733MHz; ideal for application development
- a high performance dual processor 800MHz configuration delivering raw floating point power; ideal for Computer Aided Engineering (CAE) and Mechanical Computer Aided Engineering (MCAE), life sciences, secure Web serving, and Digital Content Creation (DCC)

HP's Itanium-based solutions feature attractive pricing, leasing and financing options. The uniprocessor i2000 starts at $7,995 US and includes three operating systems and an enhanced graphics card. All HP Itanium-based systems can be purchased directly through HP or an authorized reseller. For complete purchase details contact your HP representative. For additional specifications on each system, **See:** www.hp.com/products1/itanium/servers_workstations/index.html. ✦